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Proceedings of the regional peer review of the Impacts of an agricultural drain maintenance project on aquatic species at risk in Little Bear Creek

May 11, 2016
Burlington, ON and via Teleconference/WebEx

Chairperson: Lynn Bouvier
Editor: Lia Kruger

Fisheries and Oceans Canada
Great Lakes Laboratory for Fisheries and Aquatic Sciences
867 Lakeshore Rd.
Burlington, Ontario L7S 1A1
Canada

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

A regional science peer-review meeting was held on 11 May 2016 in Burlington, Ontario and via Web-Ex. The purpose of the meeting was to peer review the impacts of an agricultural drain maintenance project on aquatic species at risk in Little Bear Creek.

Little Bear Creek is a tributary of Lake St. Clair and drains into the St. Clair River via the Chanel Ecarte in the Chatham-Kent Region. This Creek is home to several species at risk fishes including Pugnose Shiner (*Notropis anogenus*), Lake Chubsucker (*Erimyzon sucetta*), Pugnose Minnow (*Opsopoeodus emiliae*), Grass Pickerel (*Esox americanus vermiculatus*), Blackstripe Topminnow (*Fundulus notatus*), and Spotted Sucker (*Minytrema melanops*). Little Bear Creek is identified as critical habitat for Pugnose Shiner and is also designated as a municipal drain under authority of the provincial *Drainage Act*.

There is a concern that a full clean out, which includes bottom cleanout, spreading of the spoil, removal of vegetation in the channel and removal of slope vegetation (including trees and other vegetation from the top of bank) may negatively impact aquatic species at risk fishes and/or their habitats including critical habitat. Therefore, Fisheries and Oceans Canada (DFO) Species at Risk Program has requested advice from DFO Science to determine the potential impacts of the proposed clean out activities.

Participants included DFO Science, Fisheries Protection and Species at Risk programs, University of Toronto, Western University, St. Clair Region Conservation Authority (SCRCA), Milne Technologies, Ontario Ministry of Natural Resources and Forestry (OMNRF), and other experts.

This proceedings report summarizes the relevant discussions from the meeting and presents recommended revisions to be made to the associated research document. The working papers presented at the workshop will be published as Canadian Science Advisory Secretariat Research Documents.

Compte rendu de l'examen régional par les pairs des impacts d'un projet d'entretien des drains agricoles sur les espèces aquatiques en péril du ruisseau Little Bear

SOMMAIRE

Une réunion régionale d'examen scientifique par les pairs a eu lieu le 11 mai 2016 à Burlington (Ontario) et par WebEx. Elle visait à examiner les impacts d'un projet d'entretien des drains agricoles sur les espèces aquatiques en péril du ruisseau Little Bear.

Le ruisseau Little Bear est un affluent du lac Sainte-Claire et se déverse dans la rivière Sainte-Claire par le chenal Ecarte, dans la région de Chatham-Kent. Il abrite plusieurs espèces de poissons en péril, notamment le méné camus (*Notropis anogenus*), le sucet de lac (*Erimyzon sucetta*), le petit-bec (*Opsopoeodus emiliae*), le brochet vermiculé (*Esox americanus vermiculatus*), le fondule rayé (*Fundulus notatus*) et le meunier tacheté (*Minytrema melanops*). Le ruisseau Little Bear est désigné comme habitat essentiel du méné camus, et sert aussi de drain municipal en vertu de la *Loi sur le drainage* (loi provinciale).

Il y a une inquiétude qu'un nettoyage complet, qui comprendrait une vidange de fond, l'étalement des déblais et l'enlèvement de la végétation qui se trouve dans le chenal et sur le talus (notamment les arbres et autres végétaux présents sur la partie supérieure de la berge), ait des conséquences négatives sur les espèces de poissons en péril et leurs habitats, particulièrement leurs habitats essentiels. Ainsi, le programme des espèces en péril de Pêches et Océans Canada (MPO) a demandé au Secteur des sciences du MPO de préparer un avis afin de déterminer les impacts possibles de la proposition d'entretien.

On compte notamment parmi les participants des représentants du Secteur des sciences et des programmes de protection des pêches et des espèces en péril du MPO, de l'Université de Toronto, de l'Université Western, de l'Office de protection de la nature de la région de Sainte-Claire, de Milne Technologies, du ministère des Richesses naturelles et des Forêts de l'Ontario ainsi que d'autres spécialistes.

Le présent compte rendu résume les discussions pertinentes tenues lors de la réunion et décrit les modifications recommandées à apporter au document de recherche connexe. Les documents de travail présentés lors de l'atelier seront publiés en tant que documents de recherche du Secrétariat canadien de consultation scientifique.

INTRODUCTION

Little Bear Creek is a tributary of Lake St. Clair and drains into the St. Clair River via the Chanel Ecarte in the Chatham-Kent Region. This Creek is home to several species at risk fishes including Pugnose Shiner (*Notropis anogenus*), Lake Chubsucker (*Erimyzon sucetta*), Pugnose Minnow (*Opsopoeodus emiliae*), Grass Pickerel (*Esox americanus vermiculatus*), Blackstripe Topminnow (*Fundulus notatus*), and Spotted Sucker (*Minytrema melanops*). Little Bear Creek is identified as critical habitat for Pugnose Shiner and is also designated as a municipal drain under authority of the provincial *Drainage Act*.

The Municipality of Chatham-Kent has submitted a "Drain Maintenance Request" to excavate and remove accumulated sediment from the Little Bear Creek Drain. In-water works are proposed for 29.5 km from the mouth and upstream to Countryview Line, where the remaining drain portions are buried. Excavation will be undertaken by a combination of drag-line crane rigging, and long and standard hydraulic excavators. A number of culvert and enclosure works are also proposed in the headwater areas of the drain. Small brush and larger trees are also to be removed from the shoreline along the entire length of the drain.

There is a concern that a full clean out, which includes bottom cleanout, spreading of the spoil, removal of vegetation in the channel and removal of slope vegetation (including trees and other vegetation from the top of bank) may negatively impact aquatic species at risk fishes and/or their habitats including critical habitat. DFO Species at Risk Program has requested advice from DFO Science to determine impacts of the proposed clean out activities. As a result, a peer review meeting was held on May 11, 2016 in Burlington, Ontario. Meeting participants (Appendix 1) included DFO (Science, Species at Risk and Fisheries Protection), OMNRF, University of Toronto, Western University, Milnes Technologies, St. Clair Region Conservation Authority and other experts. Numerous background document and two working papers were drafted by DFO and distributed to participants prior to the meeting.

The intent of this meeting, as described in the Terms of Reference (Appendix 2), was to determine the potential impacts of the proposed clean out activities.

Specifically, science advice was required to:

1. Determine the impacts that the proposed maintenance would have on species at risk fishes in Little Bear Creek.
2. Provide alternative maintenance scenarios and determine the impact they may have on species at risk fishes in Little Bear Creek.
3. Provide mitigation measures that could be used to minimize the impacts of maintenance on species at risk fishes in Little Bear Creek.
4. Provide offsetting scenarios (qualitative) for each alternative drain maintenance scenario.

The meeting generally followed the agenda (Appendix 3). The meeting Chair provided a brief overview of DFO's Canadian Science Advisory Secretariat (CSAS) Science Advisory Process and the guiding principles for the meeting.

This Proceedings report summarizes the relevant meeting discussions and presents the key conclusions reached during the meeting. Science advice resulting from this meeting is published on the DFO CSAS website in the Science Advisory Report series. The technical details supporting the advice are published in the Research Document series. The complete list of

references for material cited in this report can be found in the Research Documents (Montgomery et al 2016; Reid et al. 2016).

PRESENTATION: LITTLE BEAR CREEK AQUATIC VEGETATION AND FISH HABITAT SURVEY 2014

Presented by: Johan Wiklund

Summary

The objective of this survey was to characterize the aquatic macrophyte communities and fish habitat of 25 sites in Little Bear Creek.

Research questions included;

- Do the macrophyte communities differ along the length of the Little Bear Creek?
    - With respect to abundance, taxa richness
    - If so, what environmental factor(s) likely are at play?
- How does water quality differ among sites?
- Does the Wetland Macrophyte Index (WMI) infer differences in habitat quality among sites?, and
- Is the distribution of species at risk fishes in Little Bear Creek related to macrophyte distribution and habitat quality among sites?

Macrophyte survey methods included transect lines established perpendicular to shore, Quadrats (0.25 m^2) surveyed every 3 m starting 1 m from shore, the depth, and % cover of each macrophyte taxa present are assessed (while snorkeling) and recorded, collect voucher specimens and if total quadrat number was ≤ 10, then a 2nd transect is surveyed nearby.

To determine water clarity, the amount of photosynthetically active radiation (PAR; 400-700 nm) was measured at several depths per site using a submersible PAR meter during the macrophyte survey. This was used to calculate the light extinction coefficient (Kd-PAR; a measure of water clarity) of a site. Four hundred and five quadrats were surveyed over 25 sites which spanned ~15 km from the mouth of Little Bear Creek to north of Prince Albert Rd Bridge, 27 macrophyte taxa were encountered, Includes macrophytic and colonial algae. Electric Line crossing between sites 12 and 13 ~4.7 km from the mouth appears to divide the system. Above it, macrophytes are abundant and the majority of species at risk fishes are found. Below it, underwater light availability is poor and macrophytes and fishes at risk are much less abundant. The species at risk fishes present in the system have a preference for heavily vegetated waters. Macrophytes appear to be primarily limited by light in Little Bear Creek, which is dependent on a combination of water clarity and depth. If ≥10-25% of surface illumination can reach the sediment surface, macrophytes should do well given no other limitation. The Wetland Macrophyte Index categories the Little Bear Creek as being an impaired to heavily degraded system (macrophyte taxa present are indicative of poor water quality).

Discussion

A participant asked if there was something about the Electric Line road crossing that affects the change in habitat above and below. The presenter responded that one aspect is that the channel gets shallower upstream. Another might be that just downstream of Electric Line there is another agricultural drain that empties below and that brings in more water. The presenter

speculated that water quality is likely the driving factor. The presenter thought that more water quality chemistry data would help with understanding the effects of change of habitat. The presenter also mentioned that while looking at Kd-PAR values for the lower section of Little Bear Creek, he found trends of improved water quality approaching the river mouth. He also noted that measurements were taken right after a thunderstorm so there was lots of run-off. Johnson Channel was back flowing into Little Bear Creek which has higher river quality.

There was a discussion about habitats becoming permanently or temporarily lost. A participant asked if the habitat will grow back after a year following dredging. They asked if the presenter could comment on how the vegetative community will change and if it the original vegetative community will reestablish itself after dredging. The presenter responded that it is highly dependent on water depth, and the amount of light that can reach the river bed. If they take the proposed dredge depth and applied the Kd-PAR then they would have an idea of how much light will reach the bottom of the channel after dredging and if it is above 10%, then the vegetation should reestablish. Assuming there is good light penetration; recolonization should proceed depending on characteristics of species (e.g., duckweed will have no problem, lily pads and tube forming plants will take longer). The presenter noted that if there are areas upstream that are not being dredged those areas could act as a seed bed that would eventually recolonize the areas downstream that have been dredged. A participant wondered if the analysis on proposed depth should be rerun. Another participant agreed that rerunning the analysis would be a good idea. A participant raised a concern that Kd-PAR values were calculated from a single sampling event and these values may not be reflective of general water quality. The presenter agreed that this concern was justified but indicated that he believed some data is better than none. The presenter asked the group if they were planning on removing any trees from the banks, and commented that tree removal would result in the removal of shade, which would increase light penetration. It was indicated that the removal of shade will be beneficial to the vegetation community. However, another participant warned that the removal of trees would also lead to decreased bank stability, and possibly increase turbidity.

A participant wondered if there was any comparison between PAR and Secchi depths. The presenter answered yes. Another participant mentioned that Secchi tube values may not be the most appropriate measurement as it is often difficult to read, depending on the clarity of the water. The longest tube is 1.2 m, which is not the case in Little Bear Creek, but could be a problem when using Secchi depth.

A participant asked the presenter if he could clarify the timeline for a quick recolonization. The presenter said that some species could come back within a year. Algae (e.g., *Nitella*) will come back quickly. *Potamogeton* and milfoil like to fragment and propagate downstream and would come back within a year. The presenter did not think there was a lot of research on this subject. He predicts lily pads would take several years to come back. *Chara* should quickly grow back. A participant asked if there will be dredging in areas where mussels are present. The presenter responded that mussels were present at two of three sites that he sampled. Another participant commented that no mussel surveys have being conducted on the creek but they thought that information on sites with mussels would be interesting. The presenter said that a report with the locations of the mussels would be provided.

The results of this work will be catalogued by the DFO library and will be posted on the library website. There are no plans for the results to be published elsewhere.

A participant commented that they have a long term water quality site on Bear Line Road with nutrient, metal, pH, temperature, etc. information. This might help with light level changes over time. The presenter responded that it would be interesting to look at and they should discuss after the meeting.

PRESENTATION: MULTIBEAM BATHYMETRY SURVEY OF LITTLE BEAR CREEK, ONTARIO

Presented by: Scott Milne

Summary

Multibeam Sonar is a sound navigation and ranging device, transmitting pulses of sound into the water and searching for echoes either from targets within the water or from the bottom itself. Since the general properties of sound in water are known, depth can be calculated based on the amount of time that is required for the transmitted pulse to return back to the echo sounder.

The first attempt to survey Little Bear Creek occurred on November 18, 2014. Unfortunately, due to unforeseen cold weather, the survey could not occur. The survey was then rescheduled for June 2015. They set up a GPS correction system on a DFO truck that was onsite, which allowed them to get a very fine resolution. The Kongsberg M3 sonar system was deployed on a gunwale pole mount on the forward port-side of the aluminum boat. All M3 multibeam sonar data were recorded on a laptop. RTK corrected DGPS data (with true heading) were recorded using a Hemisphere VS110 GPS system set-up in the roll configuration. RTK base station corrections were provided to the rover GPS system from a Microhard Systems VIP 2.4 GHz radio modem.

An 11 km-reach was surveyed from Chenal Ecarte to the Highway 40 bridge. They could run the entire width of the channel in about six passes. There were 66 km of transects completed to get nearly full coverage of the channel.

Data collection challenges and bathymetry model assumptions included;

- Little Bear Creek is a survey of relative depth, not absolute elevation.
    - Level-logger data not referenced to surveyed elevation benchmark (msl)
    - GPS derived elevation highly variable
- GPS error from overhead foliage and loss of line-of-site to RTK base station.
    - Positional uncertainty
    - Vertical (elevation above sea-level) uncertainty.
- Little bear Creek Shoreline
    - Bank-to-bank width uncertainty
    - Bank-to-mid channel (slope) uncertainty
- Data Clean-up Includes
    - Submerged Macrophyte Stems
    - Coarse woody debris
    - Fish schools will cause

MBES technology provided a fast and efficient method for generating highly detailed bathymetry surfaces of Little Bear Creek. The entire 11 km river run was completed in 1.5 days with a three person crew. RTK GPS accuracy reduced where banks are steep and/or overhanging trees and foliage reduced satellite and RTK reception (Under trees in Reach 1 and Reach between Bush Line and Greenvalley Line). A poor fit between the riverbank GIS layer and the observed multibeam bathymetry model increased uncertainty in the modelled channel width and shoreline

slope parameters. Supplementary mapping using a boat-based laser ranging system (see LaserTech MapStar, Riegl or Dynascan) or aerial LIDAR (when overhanging foliage least) is recommended. The Little Bear Creek MBES raw data set included additional fish habitat information including SAV stem height and coverage, presence and size of coarse woody debris, and existing infrastructure (culverts, pipes, pilings, etc.).

Discussion

The bathymetry collected from this survey was used as one of the main data sources for subsequent modelling efforts. Prior to this survey there was very little information on bathymetry for Little Bear Creek; the 2011 drainage report included a few cross-section profiles.

PRESENTATION: ADVICE REGARDING PROPOSED MUNICIPAL DRAIN WORKS – FLUVIAL GEOMORPHOLOGY IN THE PRESENCE OF SPECIES AT RISK

Presented by: Jason Barnucz

Summary

The advice provided in this technical memorandum consists of the impacts of the proposed drainage works, under the Ontario Drainage Act on the fluvial geomorphology, hydrology and eco-hydraulics of Little Bear Creek. This advice is given within the context of species at risk currently found within Little Bear Creek, Ontario.

Little Bear Creek is a low gradient warm water stream that flows across a low-relief topography dominated by Toledo Clay soils and alluvium. This UEM Technical Memorandum served to assess the fluvial geomorphic stability of Little Bear Creek as it exists currently and discuss possible impacts from the proposed repair and improvement works, comment upon the capacity of the Creek/Drain to transmit water downstream, and to explore opportunities for the improvement of drainage as well as the improvement of habitat features for numerous species at risk.

The study area includes eight reaches and the total channel length for the reaches is 29,528 m or 29.5 km. Each of the study reaches was evaluated for specific evidence of aggradation, degradation, widening, and plan form adjustment. From this evaluation, an index score was derived. The index scores are indicative of general geomorphic stability: a score of less than 0.20 indicates a stable system (in-regime), a score of 0.21 to 0.40 indicates a stressed/transitional system, while a score of greater than 0.40 is indicative of an adjusting (instable) system.

In conclusion, dredging the lower reaches of the Little Bear Creek will do little to improve the conveyance capacity of the drain. This is the case from at least Highway 40, downstream to the mouth of Little Bear Creek at the Chenal Ecarte. It is recommended that Little Bear Creek be modelled using a 1D hydraulic model such as HEC RAS to determine exactly where the backwater elevations discussed above begin to create a significant loss of cross sectional conveyance area due to ineffective flow. Should the proponent feel that there is in fact significant momentum in the system to reduce the ineffective cross sectional areas due to backwater elevation, it is further recommended that a 2D or 3D hydraulic model be used to quantify this reduction.

The assessments concluded that Little Bear Creek is either in a transitional state or is stressed/instable (the instable reach lies between Prince Albert Road and Highway 40). The primary mechanism for geomorphic instability was found to be planform adjustment and channel widening. The upper reaches (source to Highway 40) are experiencing active erosion in the

form of widening. The lower reaches (prone to backwater effect from Chenal Ecarte and Lake St. Clair) are experiencing some aggradation of sediments due to decreased stream velocities because of backwater resistance.

Discussion

A participant made a general comment that there had been a lengthy discussion about vegetation. They wanted to look at the backwater effect that occurred, especially in Little Bear Creek. They would like to quantify where the line is as it varies year to year and day to day. They wondered where Lake St Clair is coming up to in the river. With dredging activities, they wondered if dredging would increase hydraulic conveyance. The presenter indicated that he did not think dredging would increase hydraulic conveyance.

PRESENTATION: SEASONAL VARIATION IN THE COMPOSITION OF FISHES CAUGHT DURING TRAWL-BASED SURVEYS OF LITTLE BEAR CREEK, ONTARIO

Presented by: Scott Reid

Abstract

Little Bear Creek, a tributary of Lake St. Clair, is classified as an agricultural drain and has been identified for maintenance. The creek supports six fish species at risk including Pugnose Shiner, Lake Chubsucker, Grass Pickerel, Blackstripe Topminnow, Spotted Sucker, and Pugnose Minnow. Project staging, fish exclusion methods, and timing windows for in-water works (Aug. 1 to Mar. 15[1]) have been proposed as mitigation to minimize drainage work impacts. To assess whether the proposed timing window would minimize the risk of direct mortality to fish species at risk, a trawl-based fish survey was completed over three different time periods (summer, fall and early winter) in 2015. A total of 3,715 individuals representing 32 species were collected from 30 trawling sites. Overall, the most abundant species were Bluegill (*Lepomis macrochirus*), Brook Silverside (*Labidesthes sicculus*), Ghost Shiner (*Notropis buchanani*) and Gizzard Shad (*Dorosoma cepedianum*). Of the six fish species at risk known from Little Bear Creek, only the endangered Pugnose Shiner was captured. Two invasive species were also detected, Round Goby (*Neogobius melanostomus*) and Tubenose Goby (*Proterorhinus semilunaris*). There were large among-season differences in the abundance and composition of Little Bear Creek fishes. The greatest number and diversity of fishes were captured during fall trawling. Ninety percent of all Pugnose Shiner were collected in the fall. The largest fall to winter declines in distribution and abundance were associated with bass, crappie and sunfish species. Compared to the fall, fewer Little Bear Creek fishes are expected to be affected by maintenance activities during the winter. While the timing window is outside spawning and egg incubation periods, it is not likely to avoid the early-rearing period for Pugnose Shiner or direct impacts to young-of-the-year (YOY) fish species at risk.

Discussion

A participant asked how much overlap there would be in the timing window that goes until March 15. Another participant added that it was unlikely to avoid early rearing, and they asked what time would that overlap with the proposed timing window. The presenter responded that it

[1] After the meeting, OMNRF sent an email to the Chair correcting the end winter date to March 15 (March 10 was the date given at the meeting). March 15 will be used throughout this document when the in-water works end date is discussed.

depends on how they define early rearing, and how big fish need to be before being able to swim away from disturbance on their own. The participant thought that when looking at a minimum of a few weeks, it would be best if work did not happen until winter or late fall. They clarified that early rearing time is interpreted as 2-3 weeks.

A participant commented that as long as water temperatures are high, they would expect higher growth rates for YOY. When water temperature falls and no substantial growth is expected, that could be a good indicator of when they would be suitable to study. They want YOY to grow as much as possible before being subject to the project. Another participant noted that there was concern that in the winter when doing bank reshaping, it will be more likely to have erosion and deposition, especially during spring flow. Using water temperature would take it to the fall but not winter. It would be a biologically based compromise. A participant commented that there have been a lot of surveys done in these systems. They have seen decreased fish activity below 10 °C, leading to a decrease in fish abundance. For these surveys, it worked out well last winter. If the surveys had been done in 2014, the creek was frozen over so they would have had to drill holes. The surveys were conducted in November and the temperature was 4 °C and they saw decreased fish abundances. The presenter also indicated that there is a four to size week window where the ground is not frozen and there is decreased fish movement. The participant suggested that this time period be used for in-water works. The participant also suggested that they could look at the logger data, which includes some water temperature information for the fall and winter. Another participant agreed and added that it is good for other species at risk (e.g., turtles). They will work with temperature and fish growth to help offset other species concern.

A participant asked if there are any in-situ temperature records for points in the creek. Two participants responded that they were not aware of any. Another participant asked what was being prioritized for bank work; avoiding direct mortality or protecting habitat. Another participant responded that both are current priorities. Most of the bank stabilization work would not occur in the winter. They would target areas where restoration needs to take place but minimize work until the time when vegetation starts to come back. Only dredging would occur in the winter, not bank repair. A participant asked if anyone knew when turtles go into hibernation. A participant responded that it generally occurs in late October-early November but it is species-dependent. It was asked if there is a preference to do work before turtle hibernation. Another participant responded that the work associated with banks should be done before turtle hibernation. Another participant commented that there is very little bank work proposed for this project, and the proponents will not be dredging the creek banks. Decisions on bank stabilization work will be considered on a case-by-case basis.

PRESENTATION: FISH EXCLUSION OPTIONS FOR AQUATIC SPECIES AT RISK FOR DRAINAGE ACTIVITIES IN LITTLE BEAR CREEK, ONTARIO

Presented by: Jason Barnucz

Summary

The results of previous Canadian Science Advisory Secretariat (CSAS) request to evaluate mitigation measures within various reaches of Little Bear Creek to minimize the potential impacts of the proposed drainage work was presented to the group for informational purposes. To provide science advice for the current request, the practicability of fish exclusion techniques to reduce harm to fishes at risk during drainage activities was examined. Fisheries and Oceans Canada (DFO) Species at Risk Program requested that DFO Science address the following questions regarding agricultural drain maintenance mitigation within Little Bear Creek;

- Could fish exclusion be used as a mitigation strategy to minimize harm to species at risk fishes present in Little Bear Creek in the area proposed for drain clean out?
- Would reach-specific physical parameters (e.g., size of waterway, water clarity) compromise the effectiveness of fish exclusion?
- Could the resulting fish exclusion techniques be practically implemented on the scale required for Little Bear Creek?

Prior to this study, the fish species at risk in Little Bear Creek included Pugnose Shiner (Endangered), Lake Chubsucker (Endangered), Grass Pickerel (Special Concern), Blackstripe Topminnow (Special Concern) and Pugnose Minnow (Special Concern). During this study, Spotted Sucker (Special Concern) was detected for the first time in the Little Bear Creek.

This science response consisted of two experiments:

1. To determine how well fishes were removed from a hypothetical work site and isolated over time using two large isolation nets.
2. To determine how effective block nets were at isolating fishes; using a combination of remote sensing and seining.

Could fish exclusion be used as a mitigation strategy to minimize harm to species at risk fishes present in Little Bear Creek in the area proposed to be cleaned out?

They concluded that fish exclusion could be used as a mitigation strategy in Little Bear Creek to minimize harm to species at risk fishes in Reach 1 through Reach 6. Well-placed isolation nets are an effective tool to isolate fishes from proposed work areas. An average of 80% of fishes could be removed from isolated work areas with as little as two hauls using a well-deployed and retrieved bag seine. Seining crews must be diligent during seining activities to ensure safe capture, removal, and release of fish species at risk from prescribed work areas. Failure to do so could result in additional stress and/or mortality to captured fishes.

Would reach-specific physical parameters (e.g., size of waterway, water clarity) compromise the effectiveness of fish exclusion?

The two habitat variables that are most likely to impact fish exclusion are stream channel width and water depth. Depth in the main channel ranges from 1.2 m to 2.2 m in the same reach and width ranges from 46 m to 22 m. Reach 1 has the widest channel with widths regularly exceeding 25 m. Fish exclusion in this reach would be the most challenging. Reaches 2 through 5 largely have channel widths less than 25 m, making fish exclusion easier. Stream flow (discharge) and wind did have some influence on net setup and maintenance during field experiments, and field crews would have to occasionally adjust nets that would move slightly due to the influence of stream flows and wind. Overall, these had little influence on activities in either experiment.

Could the resulting fish exclusion techniques be practically implemented on the scale required for Little Bear Creek?

It has been demonstrated that fishes can be captured and removed from sampling sites within the main channel of Little Bear Creek. Results demonstrate that large numbers of fishes can be captured using seine nets from non-wadeable habitats in large agricultural drains. Deployment and retrieval of nets will require expertly trained professionals that are able to carefully operate vessels, deploy nets, retrieve nets and handle fishes. Failure in any of these areas could be a significant liability to persons, equipment and fishes.

Alternative Mitigation measures to reduce the impacts of drain maintenance on fish species at risk in Little Bear Creek include the use of appropriate timing windows for the fish species at risk in Little Bear Creek, use of appropriate equipment to reduce impacts to fish species at risk in Little Bear Creek, use of appropriate project staging to reduce impacts to fish species at risk in Little Bear Creek, and preservation of Riparian Vegetation to help reduce impacts of drain maintenance on fish species at risk in Little Bear Creek.

Future studies are required. During net deployment, boat activity would cause a considerable reduction in fish targets within the DIDSON field of view. Once nets were in place and the boats were removed from the work area the number of fish targets would increase again. The influence of disturbance (e.g., noise, vibration) on fish behaviour was not tested during these field experiments. However, noise could prove a useful mitigation tool if it can be used to move fish from work areas. Other control measures, such as underwater speakers, seismic plates, bubble barriers, and strobe lights should be evaluated as potential fish exclusion methods. Studies are required to determine timelines for recovery of fish populations and their associated habitats.

Discussion

A participant asked if there was any unexpected fish mortality in experiment 1. The presenter responded that there was not. What he did find unique was they had two nets, one instantaneous and one delayed. When chasing fish around, they wondered if they could get stuck in net corners. etc. They used net poles to chase fish out. With the instantaneous net, they left it in place after five passes and went back to the delayed net for five passes. They then went back to the instantaneous net for a sixth pass and nothing came out. There was increased confidence of getting fish out of those enclosures. The presenter said that gives two options:

1. Bring nets across river, pull fish, do work, and then pull net out.
2. For mitigation, they could remove fish from enclosure and transfer them to somewhere else.

A participant noted on the summary of the DIDSON observed relative fish activity that higher frequency of the sonar equals seeing more fish.

A participant asked if the presenter could comment on the proportion of species at risk fish collected in experiment 2. The presenter said they detected a few species at risk but it is hard to recommend what seine haul would be good for species at risk fish. They normally would need at least four to five hauls but in Little Bear Creek, species at risk fish are very rare.

A participant asked if the dense emerged vegetation had an impact on the effectiveness of the nets. The presenter said it did. Different net sizes were used but it had a heavy net line which removed macrophytes. In other studies, the presenter noted an increase fish abundance after the first seine haul. He concluded that this is because the first seine haul tends to remove macrophytes and other hiding places used by fish; therefore resulting in a greater number of fishes in the second seine haul (when compared to the first). In the lower creek where water depth is greater, and there are a greater number of macrophytes (along shore) it will not influence the abundance as much. As long as they do enough replicates, they seem to catch enough fish despite number of macrophytes.

PRESENTATION: A MODELLING-BASED ASSESSMENT OF THE IMPACTS OF DRAIN MAINTENANCE ON FISH SPECIES-AT-RISK HABITAT IN LITTLE BEAR CREEK, ONTARIO

Presented by: Fielding Montgomery

Abstract

Little Bear Creek drain, a tributary to Lake St. Clair in southwestern Ontario, supports 61 freshwater fish species, six of which are listed under the federal *Species at Risk Act*. In 2012, a "Drain Maintenance Request" was proposed by the Municipality of Chatham-Kent, under the provincial *Drainage Act*, to repair and improve the functionality of Little Bear Creek drain. Proposed drain maintenance activities included the removal of substrate and vegetation from the creek, which may lead to the loss of critical habitat for fish species at risk. To predict the impacts of drain maintenance, the distribution and habitat requirements of fish species at risk in Little Bear Creek were modelled. Regression tree analysis was used to develop a statistical model (R^2= 0.52; AUC=0.75) to predict vegetation cover as a function of water depth (m) and distance from the mouth of the creek (m). The vegetation cover model was used to predict suitable habitat (defined as vegetation cover > 50%) for two of the six fish species at risk: the endangered Pugnose Shiner (*Notropis anogenus*); and, the special concern Blackstripe Topminnow (*Fundulus notatus*). Impacts to suitable habitat were assessed under three drain maintenance scenarios:

1. the proponent's initial proposed maintenance;
2. no drain maintenance; and,
3. the proponent's revised proposed maintenance.

The amount of suitable habitat permanently and temporarily lost under the initial drain maintenance proposal is 19% and 42%, respectively. The revised drain maintenance proposal reduces the amount of habitat temporarily lost by 2%. There is no significant difference in patch size (p=0.98), or distance to the nearest patch (p=0.38), for biologically distinct patches, among all three scenarios. However, under both the initial and revised scenarios there is a five-fold increase in the maximum distance to the nearest patch size. Increased fragmentation of remaining habitat patches is expected to have additional negative impacts on population viability. Mitigation and offsetting measures are provided to potentially minimize the impacts of drain maintenance on fish species at risk in Little Bear Creek.

Discussion

A participant commented that knowing that there are strips of non-dredged areas parallel to dredged areas, this should allow for a good recolonization. The plants could fragment, break off and travel and therefore, the 1-2 year predicted regeneration time should be relevant. Another participant also commented that those areas with the dredging are probably mostly lost, but the border area right next door should help. A participant asked if the presenter knew how much of the sediment would be removed in the dredging process. Another participant responded that it varies, but little sedimentation is removed. Some areas may not need dredging and some less than a foot, less than a metre. Other participants agreed. Another participant commented that most aquatic plants do not have deep roots especially those in the Little Bear Creek study area.

A participant asked if they are changing the substrate hardness and ability for plant to regenerate at that site when re-dredging. They wondered how deep they were dredging and how this might change. Another participant responded that it could definitely influence plant regeneration, but since they did not know what is found under the first layer of substrate (i.e.,

clay) it is difficult to comment on. For example, in silty soil, *Chara* could do well, while rooted macrophytes would have difficulty. A participant noted that the vegetative benches will be quite wide, and they will request that less material be dredged out.

A participant asked if they were creating areas where *Phragmites* will establish. Another participant responded that it will depend on how much vegetation is removed. Phragmites generally establishes when there is a disturbance (e.g., vegetation cleared or change in water elevation). It becomes a problem once it roots. If the proponents can maintain vegetation cover and water level in Little Bear Creek, it will help to mitigate *Phragmites* establishment. Another participant added that *Phragmites* should not appear downstream from Prince Albert. They are not touching the side and water levels should not be fluctuating.

A participant asked if the width of the river was greater than 10 km. They would like to maintain a width of the centre 12.2 m and they wondered if it was wider than that. The presenter said according to the GIS layer it is wider than 12.2 m. At Hwy 40, the river width varies throughout reach 5, but is generally between 20 and 22 m. Another participant added that when they did surveys, they had to sew the nets together to get 23 m which barely reached the banks of reach 5. The presenter said that nothing was wider and all proposed bottom widths fit within the GIS layer. A participant asked how much of the river was wider towards the 20 km wide section. A participant thought that there was a 6 to 7 m of wide 20 km + wide river section was proposed. Another participant clarified that in the revised document, that proposal was dropped. A participant commented that the revised model shows that the wider width still destroys vegetation so the maximum width should be lowered. Another participate commented that there is not many species at risk in the upper reaches and only one Grass Pickerel has been detected from reach 6.

A participant wondered what the time line was for the work. Another participant responded that they are looking at phased approach. They already cut along the tops of banks in the winter of 2014. Phase 1 was to dredge reach 6 and reach 7, which was completed a while ago. They are currently moving forward to stages 2-3 (stage 2 is to dredge reaches 1, 3, 4, which will begin in August 2016, then stage 3 includes dredging reaches 2, 3, which will occur August 2017). A participant added that the work will be highly dependent on the imposed timing windows. If a 3-month timing window is used, the project will take several years to complete. At a meeting with the proponents, they were asked 'if there were no timing windows and they could start dredging tomorrow, how long it would take to complete the project?' The proponent replied that it would take approximately 1.5 years. Adding a window for fish and crops will increase it to 3-4 years minimum.

They suggested that they could have three different crews and do it all in three months. Or use a barge for reach 1. The original project proposal was to only do it from the sides but now a barge will help reach everything. But they still wondered how long that might take and there is a possibility that the equipment will not be available. They said that the contractor who did reach 6 can reach 90 ft., which is impressive and could speed things up but the contractor needs two machines, one to pull and one to lift the heavy drain. A participant commented that in all staging, every time they stop/start will provide a window for the stream to restore itself which is important to consider for mitigation. Windows for crops and fish would be beneficial. Another participant suggested that rather than trying to shorten the timeframe, they could stretch it out to minimize effects at a given time. The presenter wondered if they did any processing or any quantification on how many fish were removed when they dredged reach 6. A participant responded that there were fish in dredges but this was not quantified. A participant wondered if the *Fisheries Act* allowed for killing fish. A participant indicated that it would not be possible to quantify the amount of fish harmed as you would have to survey the entire dredgeate pile, and this is not feasible. It is known that there is a direct loss associated with the work.

A participant said there was an internal discussion on looking at photos of dredging. They thought that they must recognize that this is done in a narrow channel where fish cannot escape, unlike in a large body of water. A participant commented that the machine was very accurate. There is a video that shows that the machines do not touch the edges of the river. A participant added that the operator was very experienced. A participant asked which way the operator worked (upstream or downstream). Another participant said the operator was working from downstream to upstream. Previously, switching directions was the only time when they got significant amount of fish in the dredging. Every time they created a hole in water, all the water rushed in and getting fresh fish coming in as they moved upstream. Impacts from turbidity, etc. (other than direct mortality) should be considered. They added that the plume did not seem to go far from the lake effect. There was not any visible sedimentation in water and it did not travel far down Little Bear Creek. The contractor said some visible sediment went almost as far as reach 6.

A participant commented that according to the aquatic vegetation survey and the cut off at electric line, it was suggested that there is not as much good habitat downstream so the participant thought there shouldn't be as many issues downstream for species at risk. Possibly then they may not be as concerned with habitat in that area. The presenter added that by letting those systems go, it reduces connectivity. A participant said there are still areas along sides for connectivity. The presenter thought there wasn't that many areas that were shallow, and therefore less suitable habitat. A participant commented that further downstream, the channel is deeper and wider so habitat is smaller and more important to maintain populations. A participant asked where habitats were found downstream. The presenter responded that habitats were found along the edges, but just in pockets. The slope would be very steep. A participant thought it could easily be put into mitigation, especially in the bottom end. Another participant commented that during previous work, they flagged locations of habitat for species under study. In these locations, they couldn't do work but it is ok to do it above and below those areas. Contractors would need visual identification training so they know where to and not to work.

A participant asked if the model would account for what is needed in terms of depth, accounting for those changes throughout the year if the water levels fluctuate so much that it was noticeable at reach 6. The presenter said it would not. It was just taken from depths from JW's study. The presenter isn't sure how to incorporate it. Another presenter was wondering how it could vary the system as a whole. The presenter tried to incorporate the average elevation to standardize the system.

DRAFTING OF SCIENCE ADVISORY REPORT SUMMARY BULLETS

Discussion

Bathymetry Survey

There was a discussion on the bullets from the Bathymetry Survey section. One participant said that they were going over this last fall and they were introduced to a vendor who used drones to create imagery. They thought this would be good for surveying drains. The group wondered about how it compared to other surveys and if photo based surveys were cheaper than bathymetry surveys. One participant wondered about its accuracy. Another participant said they used drone previously for another drain in Maitland Valley and they saw before and after effects of clean out. They said that the photos included elevations and crisp pictures. A participant commented that from a Science Advice point of view it would be useful to know how they can use these tools. The group agreed that accurate GIS layer for areas with less information could be good moving forward. The group discussed imagery and plans to digitize the photos. The photos were different resolutions, some were so high and they could see vegetation and into the

water. Limitation on how far it can go in the water. A participant asked if it helped to get information on Reach 5. Another participant said they can't access information easily because it's so shallow. They would like to look at that data and see if it's usable.

Seasonal variation

The group discussed the third bullet on seasonal variation. A participant wondered if they could state that fish were not there in the winter surveys or that they were inactive and could not be captured. Another participant suggested stating that the fish were undetected. The group discussed where the fish could be going in the winter, possibly down to Chenal Ecarte, since they have detected seasonal movements downstream. The fish could be moving out of the system. By using trawling to sample both water column and benthic environment, it increases our confidence that fish are moving out of system. If it was a period of greater inactivity, fish would be closer to the bottom of creek and they would have seen more individuals in the winter benthic trawl which they did not. A participant commented that a timing window study was done for drain maintenance. There was a concern that fish are moving from habitat shelves into main channel to over winter. It was suggested that they go to benthic and pelagic trawling to see if fish abundance differs in channel. A participant said that benthic trawl didn't detect so they assume they moved somewhere else, maybe downstream. Another participant commented that assuming they do move out; more emphasis is needed to protect connectivity of patches- especially in downstream areas where they are not connected. One participant noted that Pugnose are expected to be along the sides. Another participant confirmed that there are lots of Pugnose in the channel. A participant asked if they went through the sides with lots of vegetation during the fall and winter trawl. A participant responded that when project was proposed, they had 50 trawling points that were in a systematic, random design which is enough time to subset. They randomly picked 30 from those sides and went out in September. They already had July data. Fifteen points were shallow and 15 points were deep and that's why there wasn't any benthic data in July.

A participant commented that another hypothesis is that the fish go to smaller tributaries. Another participant said that the lower river has tributaries but they are dammed. An agricultural drain pumped into Little Bear Creek. They could go into systems (they have seen cyprinid movements to the warmest water, especially Emerald Shiner, *Notropis atherinoides*) but not in Little Bear Creek. Another participant suggested that there could be fish in the inlet, but it was never sampled, but it wasn't likely since little water is pumped into inlets at that time of year. A participant was concerned with the idea that Pugnose travel large distance to overwinter. Another participant commented that active fishing gear, ex trawling, is designed to chase down and catch fish. Fish either change direction because scared or tire and fall into trawl. In colder water, fish move slower. In seine or electrofishing, they are physically chasing fish around and they don't always intercept them. So, they don't know if the fish are moving or are just harder to catch since moving at slower speed. Another participant thought that the fish would be easier to catch since they would lethargic and they didn't think that fish would have to move downstream unless winter anoxia. A participant thought that maybe trawl less scary at 4°C versus 20°C. Another participant wondered about the effectiveness of trawls in side channels with more vegetation. A participant responded that there would be less detection work and efficiency testing with trawls versus other gear. The trawl is heavier than other nets and stuff pushes through trawl easier, but still detection issue. They haven't drilled into this with trawling. A participant commented that a detection probability issue is rare and the fish are probably moving. This would be a knowledge gap that should be noted. Another participant commented that for the trawling data, they just used one pass and it could be that not all fish were detected.

The group continued to discuss the third bullet in the seasonal variation section. There was concern on whether the word "significant" was accurate and whether it was tested. A participant

said it was tested. They discussed catchability and the use of passive gear. A participant thought that there was three alternative hypotheses; the detection probability changed, fish moved overwinter, or they are in same reach but different habitat not sampled. The participant wasn't sure if they can tell which one of these is true. The group didn't think it should have a negative impact on catches. In the end, the group decided that the statement was still accurate but they should double check.

GENERAL DISCUSSION

Geomorphology study

A participant wondered if the information related to the fluvial geomorphology study would be included in the science advisory report, as that information was not reflected in the bullets that were presented. The Chair indicated that it would likely be included as a background bullet. A participant commented that there will be a lake effect, assuming there is downstream transport of vegetation to recolonize the dredged area. If a lake effect occurs, they might not see downstream flow, but there has not been any mention of lake effect and whether dredging is going to be effective. A participant referred to the geomorphology presentation and indicated that there should be an elevation cut off where elevations below the threshold should be considered at lake level and elevations above the threshold should be considered riverine. Another participant provided their opinion that they would not gain any capacity in the creek by dredging below water lake level elevation. The lake environment at Little Bear Creek is thought to occur up to and including reach 5. An estimated 95% of species at risk that occur in Little Bear Creek do so within the lake environment. If there is no hydraulic gain by cleaning, then the participant wondered why they would be doing the cleaning at all. The participant thought they needed an engineer to iron out these thoughts. Most other participants agreed with this statement.

Vegetation recolonization

The discussion went back to recolonizing vegetation. A participant commented that if re-colonization is based on transport due to flow, but then there is no flow, they would expect less transport. A participant wondered if the flow would increase and decrease due to the lake effect and therefore would still have some movement. The fragments would be pretty light. A participant said that level loggers show variation in elevation and that the direction of flow also depends on wind direction. Another participant commented that during large rainfall events, there drainage would still occur but it may not be very noticeable. A participant said that the water level gauges showed that near Highway 40, the surge of water from any event was absorbed by Highway 40. In general, this is common when a river meets a lake. A participant wondered how soon an area can be recolonized in a natural lake if the area was cleared out without a lot of water movement. A participant thought that a major issue was that there is no evidence of recovery time for vegetation or fish. Another participant responded that drains are being cleared all the time and they should be able to get that information. A participant responded that most small drains are being cleared one side to the other (full clean out) and in most cases vegetative shelves are not left. A participant said that reach 6 will show stages of recolonization. Another participant commented that benches are frequently left on those drains. They could get a list from a drainage supervisor. A participant commented that lots of tributary drains to Little Bear Creek have been cleaned out in last few years and some areas have fully revegetated. A participant commented that there is still a knowledge gap. At all these locations, a baseline study was not completed before the clean out. A participant commented that if they are dredging the center of the channel, there should be some regrowth on the channel banks.

Timing windows

The meeting participants discussed timing windows. A participant wondered what the current advice was on timing windows. There was no final recommendation and it was a topic they thought needed to be revisited. A participant noted that by looking at the fall/winter sampling, it reinforces that the timing window should be related to temperature. A participant wondered if they need to provide a temperature cutoff. Another participant asked what the temperatures were when a significant decrease in fish abundance was observed in the fall. A participant responded that it should be as close to freezing as possible (4 °C). Fall sampling was completed when water temperature was 20 °C. In early September last year they had a very hot week and caught many fish in the fall. A participant commented that there was evidence of August 1 being too early. A participant thought that if the management objective was to avoid direct mortality, then that will only occur if done by having a later start timing window. Other participants agreed. A participant wondered how March 15 was selected as the end of the timing window. A participant responded that there are timing issues at the beginning and end of the timing window, but the March date is set based on Northern Pike (*Esox lucius*). A participant suggested that this timing would protect the adult pike but would not protect the young of the year. A participant suggested further constricting the timing window. A participant questioned whether the timing window should be set based on biological parameters rather than date. Other participants agreed that setting timing windows based on biological parameters (e.g., fish size, water temperature, etc.) was a good idea, but there were no additional suggestions on how this could be accomplished.

A participant wondered what the current OMNRF timing window was for Little Bear Creek. A participant responded that it was currently March 15 and this information was sent out by the Species at Risk group. No one at the current meeting could further comment on that decision, as they were not involved in the decision making process.

A participant asked the group if they should change the August date. Another participant suggested they look at temperatures and see what emerges based on the biological criteria. The group discussed biological data and one participant noted that in the fall, the main biological criteria is when fish will be absent or less active, typically around 12 °C. Another participant commented that there was a survey conducted 2 years ago in this watershed that included 9 -10 months of water temperature data. The participant thought they could look at this data as well as using fish information from last year. Another participant thought that ideally they are looking for air and water temperatures, so they could take longer air temperatures dataset and then use the average temperature. The Chair commented that they will look at the air and water temperatures and compare the two. If possible to do so, the August date will be adjusted. A participant suggested that fish abundance is considered, and that fall catch data should be looked at to determine when fish abundance decreases. One participant noted that although the spring timing window date is important pike spawning, it is really the all timing window date that is important for fishes at risk.

A participant suggested adjusting timing even further by considering water temperature data for Grass Pickerel. The Chair agreed and will look at Grass Pickerel spawning temperatures and determine dates based on that as well as determining the spring boundary. A participant commented that they should get data from Beaver Creek and they thought that March 31 should be the earliest date. Again, a participant warned of using dates when providing timing windows, as this could be a problem when considering climate change and increasing water temperatures. Setting timing windows based on biological information is more meaningful than dates. They suggested adding this point to the report (to modify dates in future depending on changing temperatures).

Turbidity

A participant asked if there was an ability to reduce turbidity and if it would make a difference if turbidity did change. A participated responded that the extensive agriculture in the areas surrounding Little Bear Creek generate substantial clay movements. Other than making the vegetative buffers larger, or determining what goes into the creeks it is probably larger landscape issue. Another participant asked if there were any obvious places along the creek that are acting as sediment sources. A participant suggested that the geomorphology study could help to determine those areas. The study includes prescriptive mitigation technique information and they made recommendations for different bank stability, and fish habitat, etc. Another participant thought that referring to that published report would be good. A participant commented that the engineer report identified two to three areas where bank erosion is a concern. Most of the system is dyked downstream of Highway 40 and erosion is not a concern. Most of the sediment is coming from upstream of Highway 40.

Another participant added that the presence of Common Carp (*Cyprinus carpio*) is another source of turbidity. Common Carp are found throughout the system and are known to increase turbidity due to their behavior of uprooting aquatic vegetation. A participant commented that the removal of Common Carp from the system could be listed as a potential offset. Another participant commented that they did not catch many Common Carp in Little Bear Creek. Although, they detected some Common Carp in their surveys, they were always in very low abundance.

Another participant indicated that another substantial source of sediment is drain maintenance. Many of the drains have been filled, which slows down sediment flow. When a drain is cleaned, sediment transport is increased. Another participant noted that since the creek has been highly modified, it is very flat in areas and a large pulse of sediment is not common. Also, water cannot readily access the creek because of berms of sediment along the edges of the channel. The participant also noted that a plugged road outlet impedes water from reaching the creek. A participant suggested that by installing a tile header, you could water flow to the creek. Another participant commented that when tile headers are used, they need to be maintained and many are plugged. There have been complaints during the surveys that they need to be clean out. They need maintenance on the table land, not the creek which is a separate issue. The only place with tiles is at each bridge.

Active re-vegetation

A participant suggested that active re-vegetation may be used as a mitigative technique. Another participant thought that was a good idea but added that is has never been done before. They suggested keeping the sediment that had been removed during the dredging project and reseeding it back into the channel. A participant wondered if that might be a form of habitat restoration. A participant thought that perhaps the spoils could be used to reseed the creek. Another participant added that they could use those spoil to regrow vegetation as long as the areas are not dredged too deep. One participant suggested removing the top layer of sediment and macrophytes and replacing it in the creek after additional sediment had been removed.

Another participant said they could do the same type of mitigation in the lake-like portion of the system and they wondered if there was any mitigation for downstream areas where there are high banks and where the input was coming in from pumps. The participant suggested that possibly putting in sediment screens might help. A participant thought that if drainage was not an issue then there must be a maintenance plan and this should be incorporated to the report.

Pump maintenance

A participant thought they could monitor the tiled areas closely and dredge out when plugged. Another participant commented that it may not be necessary to monitor how sediment affects channel, but monitor how it affects the pump. A participant commented that at each pump, there is the local land owner that operates the pump. There is not any regular maintenance of the pumps and it is cleaned out by request of land owner. A meeting participant said that the drain superintendent maintains depth but sometimes cannot get cooperation of landowner. Lower water levels could be good but landowner won't want it to affect irrigation. A participant commented that where Little Bear drains at Prince Albert Road from top to bottom is 5 m (15-20 ft.). Tiles are every 30 m up the bank, at an elevation of 5-6 ft. above water line. It is a source of erosion. In reach 5, many areas on east side where landowner punched hole into dike is source of erosion. One farmer's area flooded so he put in a tile, which they can see on Google Earth present image that the area is filled in so all that sediment would have eroded.

Next steps

The chair asked the group if they would like to see the revisions to the research documents and the proceedings document. The group agreed that the Chair can send these documents directly to CSAS once the revisions are completed. The Science Advisory Report will be sent to the group for their review.

REFERENCES CITED

Reid, S.M., LeBaron, A. and Barnucz, J. 2016. Seasonal variation in the composition of fishes caught during trawl-based surveys of Little Bear Creek, Ontario. DFO Can. Sci. Advis. Sec. Res. Doc. 2016/070. iv + 16

APPENDIX 1: PARTICIPANTS

First name	Affiliation
Dave Balint	Fisheries and Oceans Canada, Species at Risk
Ted Barney	Ontario Ministry of Natural Resources and Forestry
Jason Barnucz	Fisheries and Oceans Canada, Science
Lynn Bouvier	Fisheries and Oceans Canada, Science
Erin Carole	St. Clair Region Conservation Authority
Eric Cleland	Ontario Ministry of Natural Resources and Forestry
Gary Cooper	Fisheries and Oceans Canada, Fisheries Protection Program
Sara Eddy	Fisheries and Oceans Canada, Fisheries Protection Program
Bill Glass	Fisheries and Oceans Canada, Science
Nick Mandrak	University of Toronto
Scott Milne	Milne Technologies
Ken Minns	Emeritus
Fielding Montgomery	University of Toronto
Scott Reid	Ontario Ministry of Natural Resources and Forestry
Johan Wicklund	Independent contractor
Greg Wilcox	St. Clair Region Conservation Authority
Katherine Wright	Note taker
Adam Yates	Western University

APPENDIX 2: TERMS OF REFERENCE

Impacts of an agricultural drain maintenance project on aquatic species at risk in Little Bear Creek

Regional Science Peer Review – Central and Arctic Region

May 11, 2016
Burlington, Ontario and via WebEx/Teleconference

Chairperson: Lynn Bouvier

Context

Little Bear Creek is a tributary of Lake St. Clair and drains into the St. Clair River via the Chanel Ecarte in the Chatham-Kent Region. This Creek is home to several species at risk fishes including Pugnose Shiner (*Notropis anogenus*), Lake Chubsucker (*Erimyzon sucetta*), Pugnose Minnow (*Opsopoeodus emiliae*), Grass Pickerel (*Esox americanus vermiculatus*), Blackstripe Topminnow (*Fundulus notatus*), and Spotted Sucker (*Minytrema melanops*). Little Bear Creek is identified as critical habitat for Pugnose Shiner and is also designated as a municipal drain under authority of the provincial *Drainage Act*.

The Municipality of Chatham-Kent has submitted a "Drain Maintenance Request" to excavate and remove accumulated sediment from the Little Bear Creek Drain. In-water works are proposed for 29.5 km from the mouth and upstream to Countryview Line, where the remaining drain portions are buried. Excavation will be undertaken by a combination of drag-line crane rigging, and long and standard hydraulic excavators. A number of culvert and enclosure works are also proposed in the headwater areas of the drain. Small brush and larger trees are also to be removed from the shoreline along the entire length of the drain.

There is a concern that a full clean out, which includes bottom cleanout, spreading of the spoil, removal of vegetation in the channel and removal of slope vegetation (including trees and other vegetation from the top of bank) may negatively impact aquatic species at risk fishes and/or their habitats including critical habitat. Therefore, Fisheries and Oceans Canada (DFO) Species at Risk Program has requested advice from DFO Science to determine the potential impacts of the proposed clean out activities.

Objectives

The objectives of the meeting are to:

1. Determine the impacts that the proposed maintenance would have on species at risk fishes in Little Bear Creek.
2. Provide alternative maintenance scenarios and determine the impact they may have on species at risk fishes in Little Bear Creek.
3. Provide mitigation measures that could be used to minimize the impacts of maintenance on species at risk fishes in Little Bear Creek.
4. Provide offsetting scenarios (qualitative) for each alternative drain maintenance scenario.

Expected Publications

- Science Advisory Report
- Proceedings
- Research Documents

Expected Participation

- Fisheries and Oceans Canada (Science Sector, and Species at Risk and Fisheries Protection programs)
- Ontario Ministry of Natural Resources and Forestry
- Academics
- Conservation Authorities
- Other invited experts

APPENDIX 3: AGENDA

Impacts of an agricultural drain maintenance project on aquatic species at risk in Little Bear Creek

Regional Science Advisory Meeting
Canadian Center for Island Water, South Seminar Room
Burlington, ON

Chairperson: Lynn Bouvier

Wednesday, 11 May 2016

Presentation	Presenter
Introductions, Objectives of Science Review, and Process	Lynn Bouvier
Aquatic Vegetation and Fish Habitat Survey of Little Bear Creek, Ontario	Johan Wiklund
Multibeam Bathymetry Survey of Little Bear Creek, Ontario	Scott Milne
Advice Regarding Proposed Municipal Drain Works – Fluvial Geomorphology in the Presence of Species at Risk	Jason Barnucz
Health Break	
Seasonal Variation in the Composition of Fishes Caught during Trawl-based Surveys of Little Bear Creek, Ontario	Scott Reid
Fish Exclusion Options for Aquatic Species at Risk for Drainage Activities in Little Bear Creek, Ontario	Jason Barnucz
Lunch (not provided)	
A Modelling-based Assessment of the Impacts of Drain Maintenance on Fish Species-at-Risk Habitat in Little Bear Creek, Ontario	Fielding Montgomery
Discussion	
Health Break	
Drafting of Science Advisory Report Summary Bullets	Lynn Bouvier
Closing Remarks	Lynn Bouvier